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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/370,508	08/06/1999	UMESH SHARMA	20944.9000	8186

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EXAMINER

DEO, DUY VU NGUYEN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 05/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/370,508

Applicant(s)

SHARMA ET AL.

Examiner

DuyVu n Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 30 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 6-10, 14-18, 20-24, 26, 28-31, 33-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6-10, 14-18, 20-24, 26 and 28-31 is/are allowed.
- 6) ☒ Claim(s) 33-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. (US 6,245,682), Lou et al. (US 5,597,754), and Wolf et al. (Silicon Processing for the VLSI Era, Vol.1).

Fu teaches a method of forming a semiconductor device comprising: depositing a layer of polysilicon (claimed polycrystalline silicon) on a substrate (4, line 32); depositing an oxide layer over the polysilicon (col. 4, line 33); depositing an oxynitride layer of about 30 nm (300 angstrom) over the oxide layer (col. 4, line 33, 55, 56); depositing a resist pattern over the oxynitride (col. 4, line 63); patterning the oxynitride layer, the oxide layer, and the polysilicon layer to form a stack (col. 5, line 1-5); forming an oxide layer (claimed insulating layer) on the edge of the pattern structure (col. 5, line 13-15) and then removing the remaining oxynitride in the stack by using phosphoric acid (col. 5, line 23-25). Unlike claimed invention, Fu doesn't describe removing the oxynitride without subjecting the oxynitride to any temperature greater than about 400 degrees Celsius after the step of depositing the layer of silicon oxynitride. Since Fu teaches that there are only steps of processing the resist and forming thermal oxide layer

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between depositing and removing the oxynitride layer and it is conventional that the processing of photoresist is done with T that is under 400 degrees Celsius, as evidently supported by Wolf (pg 429-455, pg 518), and the thermal oxidation of the polysilicon is done under 400 degrees Celsius, as evidently supported by Lou (col. 4, line 16-20), it would have been obvious to one skill in the art in light of Wolf's teaching of processing the photoresist, and Lou's teaching of thermal oxidation of the polysilicon, because Wolf and Lou further describe the processing parameters that are known to one skill in the art at the time of the invention to form the resist pattern and the thermal oxide layer. The combined method would inherently not having any step that would subject the silicon oxynitride to any temperature greater than about 400 degree Celsius between the depositing and removing the oxynitride layer.

*Allowable Subject Matter*

3. Claims 1, 6-10, 14-18, 20-24, 26, 28-31 are allowed because the primary applied prior art, Fu, doesn't describe oxidizing the polysilicon of the stack or forming an oxide layer on the edge of the stack after the step of etching the remaining layer of the silicon oxynitride (or second insulating layer) in the stack. Fu describes forming an oxide layer by oxidizing the polysilicon layer in the stack prior to removing the silicon oxynitride (or second insulating layer) in order to protect the polysilicon gate stack during the next step of etching the silicon oxynitride layer (col. 5, line 32-40).

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4. Claims 34-36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 34-36 are allowable because the primary applied prior art, Fu, doesn't suggest the oxide 15, formed on the sidewalls of the polysilicon stack, by depositing the oxide layer 16 and etching the oxide to remove it from the top of the patterned structure to form oxide on the sidewalls of the polysilicon layer, prior to removing the remaining layer of silicon oxynitride by etching in hot phosphoric acid, in such a way that the oxynitride layer is not subjected to any temperature greater than about 400 degrees Celsius before being its remaining being removed.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 33-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitation of "forming a layer of insulator on the edge prior to the step of removing the remaining layer of silicon oxynitride" is vague because it is unclear if "a layer of insulator" refers to the insulator mentioned earlier in the limitation of "forming a layer of insulator on the edge of the patterned structure." If it is, it should be written as "said layer of insulator." At this time it is examined as the same layer.

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7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-3:30; with alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DVD  
5/12/04

